

REMARKS

In paragraph no. 1 of the Office Action, Claim 1 is objected to because it is allegedly unclear as to what "substantially avoiding writing previously stored data" means. Claim 1 has been amended to delete use of the term "substantially" before avoiding and incorporate it before "user data." Thus, this objection has been overcome.

In paragraph no. 2 of the Action, Claims 3, 5, 6, 7, 8, 10, and 11 are objected to because they include the claim language "said using secondly step." These objections are rendered moot by the cancellation of the claim term "secondly."

Regarding paragraph no. 3 of the Office Action, Claim 4 is objected to on the grounds that it is unclear as to what "said making step" refers to. Claim 4 has been amended in conformity with the Examiner's interpretation.

With respect to the objection to Claim 7 in paragraph no. 4 of the Office Action, it is allegedly unclear as to what "said issuing step" includes. This claim has been amended to recite that the issuing refers to issuing the trust array command.

In paragraph no. 5 of the Action, Claim 13 is objected to because of the claim terminology "substantially avoiding." The term "substantially" has been moved to refer to user data. Consequently, this objection has also been overcome.

With regard to the substantive rejections of the claims, Claims 1-8, 10-12, 14 and 16-19 have been rejected under 35 U.S.C. §102(e) as anticipated by the patent to Renner Jr. (US 6,243,827). Claims 1 and 13 are rejected under Section 102(b) as anticipated by the patent to Jones (US 5,479,653). Claim 9 is rejected under Section 103(a) as unpatentable over the Renner Jr. patent in view of the patent to Stevenson (US 6,353,895). Claim 15 is objected to as being dependent upon a rejected base claim. Claim 15 has been rewritten as independent Claim 20, including all limitations of the base claim from which it depends. Hence, new independent Claim 20 should be allowed. Independent Claims 1 and 14 have been amended, as well as dependent Claims 3-11, 13 and 18. Reconsideration of the rejection of Claims 1-19 is requested.

The present invention is directed to reusing an array of storage devices after certain failures without relying on unwanted and unnecessary procedures related to writing previously stored data, such as avoiding restoration or reconstruction processes. Fundamentally, the same storage devices

that were used before the failure are used after the failure, including providing an indication that these same storage devices are accessible after the failure has occurred. None of the prior art discloses this key feature.

The Renner Jr. patent describes procedures for handling data when there are one or more invalid regions on one or more disks of an array. Physically or logically invalid regions of disks are identified. The addresses and links of each invalid region are written to a bad region table. The bad region table is provided on disks of the array. The reusing of all disks without rewriting stored user data, when one or more of them are identified as being invalid, is not described in this patent.

The Jones patent relates to modifying a RAID configuration when one or more disk drives of an array fail. The array is initially configured for optimum performance. If it is determined that a disk drive has failed, the array is automatically reconfigured to a different RAID configuration (e.g. from RAID 1 to RAID 4). Reconfiguring can occur more than once until no redundancy remains. Like the Renner Jr. invention, the Jones apparatus and method relate to handling user data when one or more disk drives, or regions thereof, fail. This is contrary to the present invention in which it is determined that there is no actual failure of any storage device. This important distinguishing feature is brought out in the amended claims.

Referring to Claim 1, it calls for, among other things, ascertaining that a failure has occurred which is different than a failure of one or more of the storage devices. This is directly opposite from the teachings found in the Renner Jr. and Jones patents. Both these prior art patents disclose procedures to be followed whenever one or more storage devices, or regions/portions thereof, fails. In the case of the Renner Jr. invention, there are one or more invalid regions found on one or more disks that cannot be used or accessed because they have failed or are faulty. Regarding the Jones patent, a lesser number of disk drives are utilized due to one or more of them failing.

Claim 1 further recites discontinuing use of at least two of the storage devices and, after the discontinuing, updating metadata to remove indication that none of the at least two storage devices can be accessed to having the metadata indicate that the at least two storage devices are accessible. This claim language emphasizes that the metadata is in two different states. One state is indicative of the case in which one or more storage devices cannot be accessed. The other state is indicative of the case in which they are accessible. Neither the Renner Jr. patent nor the Jones patent discloses

this kind of metadata nor the two different states that exist after the failure has occurred. Regarding the Renner Jr. patent, the Examiner relies on a bad region table as allegedly constituting metadata. However, such metadata is not the same as the claimed metadata, nor is the alleged Renner Jr. metadata updated as required by the claim. More specifically, there is no removal of an indication that none of at least two storage devices can be accessed. That is, these at least two storage devices are initially indicated as being dead or invalid. Moreover, there is no suggestion in the Renner Jr. patent of changing such metadata to indicate that the same storage devices are valid. Again, the present invention is directed to utilizing all of the same storage devices that were used before the failure since the failure is different than a failure of the storage devices.

The Jones patent is less relevant than the Renner Jr. patent. There is no disclosure in the Jones patent related to updating or otherwise using metadata. In particular, there is no metadata mentioned indicative of two different states of storage devices related to their validity and capability of being used.

If the rejection of amended Claim 1 should be continued, it is respectfully requested that it be pointed out with specificity how the disclosures in the Renner Jr. or Jones patents are comparable to a failure that is different than a failure of storage devices of an array and in which, after the failure, the metadata indicates that certain storage devices are not accessible and then the metadata is changed to indicate that they are accessible. In the absence of a convincing showing to that effect, Applicant submits that Claim 1 should be allowed.

Dependent Claims 2-13 recite additional patentable subject matter. Claim 2 specifically defines failures that are not storage device failures and which trigger the updating of the metadata. Claims 3 and 4 are directed to making determinations related to the fact that the storage devices did not fail. Claim 5 more specifically defines metadata as being modified to indicate that the storage devices are valid in a primary dead partition map. Relatedly, Claim 6 requires the writing of all zeros in the primary dead partition map in connection with indicating that the storage devices are all valid. Claims 7-9 further define the determination related to the accessibility of the storage devices. Claim 10 recites that the array of storage devices can be reused based on either a user determination or an automatic determination. Claims 11 and 12 require a command generated by a host in connection with using again the array of storage devices. Claim 13 more particularly defines the

avoiding to include restoring and/or reconstructing data and/or parity. In view of these patentable limitations, Claims 2-13 should be allowed.

Claim 14 is a system claim that is substantially similar in scope to method Claim 1. Claim 14 requires that the host generate a trust array command. The trust array command updates metadata. The update includes changing the metadata from indicating that one or more storage devices is inaccessible to indicating that one or more storage devices is accessible. This command is generated after an array fault. The fault is different than a fault due to one or more of the storage devices.

The Examiner relies on the Renner Jr. patent in rejecting this claim. However, for the same reasons presented in the discussion of Claim 1, this prior art reference fails to disclose the patentable features recited in this amended claim. In particular, this prior art patent teaches what occurs when a fault or failure occurs that involves a storage device, namely, invalid or bad regions on one or more disks. This is inapposite to the present invention. Furthermore, this prior art system does not have metadata indicating that one or more storage devices is inaccessible and then indicating that they are accessible. Instead, the alleged Renner Jr. metadata indicates invalid or bad regions of one or more storage devices, not whether or not the storage device itself is accessible or inaccessible. Based on these patentable limitations, the contents of the Renner Jr. patent does not anticipate the invention of Claim 14. Accordingly, Claim 14 should be allowed.

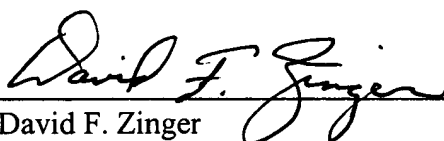
Claims 15-19 are dependent claims that depend from Claim 14. Each of these recites additional patentable subject matter. Claim 15 requires that the trust array command be generated in response to input from a user of the system. As the Examiner recognizes, the prior art lacks this significant aspect. Claim 16 requires that the trust array command be generated independently of any reconstruction or restoration of the array. The defined trust array command is not found in the prior art. Claim 17 requires that the host control discontinuing use of the array and that it receive an input to generate the trust array command. This limitation related to generating the defined trust array command is not found in the prior art. Claim 18 limits the trust array command to one that modifies a dead partition map to indicate that all of the storage devices are valid. No such modification is taught or suggested by the prior art. Claim 19 requires a determination be made before the trust array command is generated. These determinations related to the defined trust array

command are lacking in the prior art of record. In light of the further patentable subject matter of these dependent claims, Claims 15-19 should also be held allowable.

A sincere effort has been made to place the application in condition for allowance. Early notice of such allowance is, therefore, earnestly solicited.

Respectfully submitted,

SHERIDAN ROSS P.C.

By: 
David F. Zinger
Registration No. 29,127
1560 Broadway, Suite 1200
Denver, CO 80202-5141
(303) 863-9700

Date: January 21, 2008